

CLAIMS:

1. A knuckle boom apparatus, comprising:
 - a machine base;
 - a hoist boom having a proximal end pivoted to the machine base, and a distal end remote therefrom;
 - a stick boom having a proximal end pivoted to the distal end of the hoist boom;
 - at least one hydraulic hoist cylinder mounted between said machine base and said hoist boom;
 - at least one hydraulic stick cylinder mounted between said hoist boom and said stick boom;
 - a hydraulic circuit for operatively supplying hydraulic oil to said cylinders, wherein said hydraulic circuit comprises an oil flow path between working ends of said hoist and stick cylinders so as to transfer hydraulic oil between said working ends; and
 - means for producing reach.
2. A knuckle boom apparatus as in claim 1, wherein said means for producing reach comprises a bi-directional pump connected between said working ends, to control said transfer of hydraulic oil between said working ends.
3. A knuckle boom apparatus as in claim 1, with single lever control of reaching.
4. A knuckle boom apparatus as in claim 1, wherein said working ends of said cylinders are the base ends.
5. A knuckle boom apparatus as in claim 1, wherein said working ends of said cylinders are the rod ends.
6. A knuckle boom apparatus as in claim 1, wherein said circuit includes a float valve whereby the load is supported, but the boom is relatively free in terms of reach motion (extension or retraction).

7. A knuckle boom apparatus, comprising:
- a machine base;
 - a hoist boom having a proximal end pivoted to the machine base, and a distal end remote therefrom;
 - a stick boom having a proximal end pivoted to the distal end of the hoist boom;
 - at least one hydraulic hoist cylinder mounted between said machine base and said hoist boom;
 - at least one hydraulic stick cylinder mounted between said hoist boom and said stick boom; and
 - a hydraulic circuit for operatively supplying hydraulic oil to said cylinders, said circuit using a closed loop variable displacement pump for reach actuation.
8. A knuckle boom apparatus as in claim 7, wherein said circuit includes a float valve whereby the load is supported, but the boom is relatively free in terms of reach motion (extension or retraction).
9. A knuckle boom apparatus, comprising:
- a machine base;
 - a hoist boom having a proximal end pivoted to the machine base, and a distal end remote therefrom;
 - a stick boom having a proximal end pivoted to the distal end of the hoist boom;
 - at least one hydraulic hoist cylinder mounted between said machine base and said hoist boom;
 - at least one hydraulic stick cylinder mounted between said hoist boom and said stick boom; and
 - a hydraulic circuit for operatively supplying hydraulic oil to said cylinders, said circuit using two computer-controlled closed loop pumps to pump or remove oil in coordinated fashion from working ends of said cylinders, to capture mechanical energy by the engine from one pump and use it in the other.

10. A knuckle boom apparatus as in claim 9, wherein said circuit includes a float valve whereby the load is supported, but the boom is relatively free in terms of reach motion (extension or retraction).